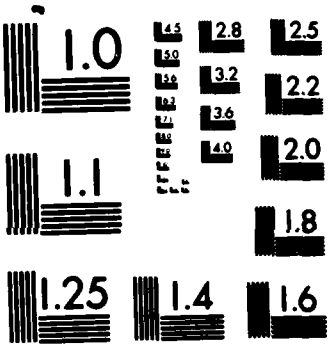
AD-A162 750 DEVELOPMENT OF A SYSTEM TO PRODUCE SEMICONDUCTOR INSULATOR MULTI-LAYER STRUCTURES(U) CLEMSON UNIV SC DEPT OF ELECTRICAL AND COMPUTER ENGINEERING 1/1

UNCLASSIFIED D J DUMIN JUN 85 N00014-84-K-2015 F/G 20/12 NL



(12)

Naval Research Labs
Quarterly Report
Contract #N00014-84-K-2015
June, 1985

AD-A162 750

Third Quarterly Report
March 1, 1985 to May 31, 1985

DEVELOPMENT OF A SYSTEM TO PRODUCE SEMICONDUCTOR INSULATOR MULTI-LAYER STRUCTURES

Dr. David J. Dumin
Department of Electrical and Computer Engineering
Clemson University
Clemson, South Carolina 29631
803-656-3190

Submitted to:

Naval Research Labs
4555 Overlook Ave., SW
Washington, DC 20375

A

GOALS

The goals of the third quarter were to complete the construction of the epitaxial reactor to be used to grow the multilayer films and to begin to grow multiple silicon-insulator films.

PROGRESS

During this quarter the parts arrived for the completion of the epitaxial reactor and the reactor construction was completed. The equipment is now operational in Olin Hall. The system was pressure tested and all lines hold pressure over night. During preliminary runs to coat the silicon carbide susceptor with silicon, it was noticed that the parts of the equipment surrounding the reaction chamber become quite hot during operation of the reactor. There are several causes for this over heating. The hydrogen flow is presently limited by the hydrogen regulator being used in the system. A higher pressure regulator is needed to increase the hydrogen flow and increase the cooling that higher hydrogen flow will provide. The susceptor presently being used is 1" thick. It will be necessary to used a thinner susceptor to lower the thermal mass in the system. It may be necessary to water cool the reaction chamber.

The first films grown in the system were silicon-on-sapphire films. The SOS films were used to determine the quality of the epitaxial system. It has proven impossible in the past to grow good SOS films unless all sources of oxygen contamination had been removed. Thus, until the system can be used to grow good quality SOS films, the system will not be considered to be completely

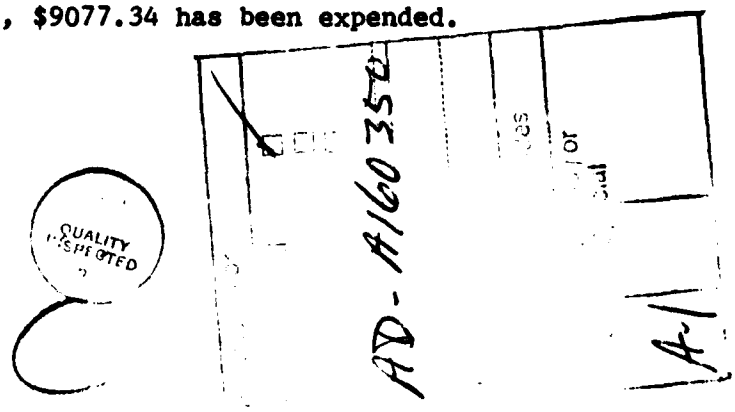
operational. The first SOS films were hazy and were not considered to be high quality. More SOS films will be grown to determine the cause of the hazyness.

PLANS FOR THE NEXT QUARTER

The cause of the hazy film growth will have to be determined. The two most likely causes of the problem are oxygen in the hydrogen carrier gas and the poor thermal geometry of the system. The hydrogen flow rate will be increased by obtaining a high pressure regulator and raising the input pressure to the hydrogen purifier. The increased flow of hydrogen should provide more gas cooling and improve the films. The thermal mass of the susceptor will be lowered by using a smaller susceptor. The system will be checked for oxygen leaks. The possibility of obtaining a water cooled epitaxial growth chamber will be explored. If a water cooled reactor appears necessary, an attempt will be made to obtain a commercially fabricated water-cooled horizontal chamber with susceptor and quartz sled. After the system has been improved to produce good quality SOS films, the system will be used to produce Si-Bp-Si structures. Good quality Si-BP-Si films should be produced this next quarter.

BUDGET

The expenditures during this quarter were for graduate student salary and for parts and supplies for the reactor. The project is about 65% complete. Of the $9996.00 budgeted for this project, $9077.34 has been expended.



. PERSONNEL

The approximate level of effort for this project during this quarter was:

Principal Investigator	Dr. David J. Dumin	10%
Graduate Student	Mr. Perry Robertson	50%

Cummulative Data as of November 26, 1984

Estimate of Percentage of Technical Completion - approximately 65%

Cost Estimates

Labor	
Principal Investigator	$0.00
Graduate Assistant	2190.00
TOTAL	2190.00
Equipment	3276.91
Supplies	1319.85
Indirect Costs	
51% of Salaries and wages, MTDC	2290.58
GRAND TOTAL	9077.34

D

END

FILMED

1-86

DTIC